ASSISTIVE DEVICE FOR BLIND, DEAF AND DUMB PEOPLE USING RASPBERRY PI

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Abstract: Assisting to the people with visual, hearing and vocal impairment through the modern system is a tough job. Now the modern-day researches are only focusing on the issues of any one of the impairments in the above challenges but not all. This work is performed mainly to find the unique technique/solution for people with visual, hearing, vocal improvement to communicate with each other and also with the normal persons.

The main part is Raspberry pi on which all these activities are carried out. This work provides the assistance to visually impaired person by making them hear what is present in text format. For hearing impaired people, the audio signals are converted into text format by using speech to text conversion technique. And for vocally impaired people, they can convey their message by the help of speaker by using text to speech conversion.

Key words: Raspberry pi, image to voice, text to voice, speech to text

I. INTRODUCTION

According to the World Health Organization (WHO), 250 million people are estimated to be blind or partially blind. 85% of visually impaired people live in developing countries. Books and all the printed material are the main sources of knowledge. The blind or visually impaired people cannot access this knowledge. Braille is writing and reading system used by the blind. However, converting all the available knowledge into Braille will be a tedious task.

New smart devices for the reading of the printed text need to be developed for the blind which is readily available and affordable to the blind community. Here we do a survey of the existing research work on the various smart devices developed for the blind for reading. We also propose a new idea for a smart reader that they can easily read the printed text or document. The scope of this research is to provide a solution and to help the blind or visually impaired people access the document easily and they can make use of this device to enhance their knowledge.

The ultimate aim of the project is to help the Blind and visually impaired people to recognize the text. When a printed text is shown in front of the web cam it has to capture the image, extract the text from the image and should read out the text either through computer audio or headphone. The code is generated using python language. This project uses the concept of image processing and OCR technique for character recognition purpose.

II. PROPOSED WORK

We are developing an effective text to speech conversion technique by using the Raspberry pi 3 processor. First the text present in the image is captured by the camera and it is stored in the cloud, the synthesizer used to separate the text from the image and then the Optical Character Recognition algorithm was implemented to recognize the characters in the text and then the Raspberry Pi 3 was the responsible to convert that text into speech by using the OpenCV libraries.
Here it offers with three stairs

- Image to Voice (For BLIND)
- Text to Voice (For DUMB)
- Voice To Text (FOR DEAF)

III. HARDWARE REQUIREMENTS

A. Raspberry pi
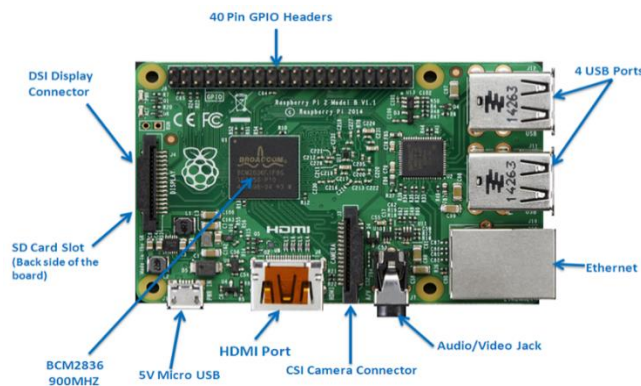
The Raspberry Pi 3's four built-in USB ports provide enough connectivity for a mouse, keyboard, or anything else but if you want to add even more you can still use a USB hub. It is recommended that you use a powered hub so as not to overtax the on-board voltage regulator. Powering the Raspberry Pi 3 is easy, just plug any USB power supply into the micro-USB port. There's no power button so the Pi will begin to boot as soon as power is applied, to turn it off simply remove power. The four built-in USB ports can even output up to 1.2A enabling you to connect more power-hungry USB devices (This does require a 2Amp micro–USB Power Supply)

On top of all that, the low-level peripherals on the Pi make it great for hardware hacking. The 0.1" spaced 40-pin GPIO header on the Pi gives you access to 27 GPIO, U ART, I2C, SPI as well as 3.3 and 5V sources.

B. Logitech Camera

The Logitech C270 HD Webcam is a high utility device that helps you to enjoy seamless video calling. This device comes with easy installation process that offers a hassle-free set up. The ergonomic design and sleek body help in saving space and makes it easy to install the webcam on your PC or laptop. The adjustable design makes it easy to tilt and use it according to your needs. It features 'Logitech Fluid Crystal Technology' and has a 3 MP camera which enhances picture quality while the integrated microphone delivers perfect sound quality. It supports video calling and enables you to record videos in HD quality. Logitech Fluid Crystal Technology. This webcam comes with Logitech Fluid Crystal Technology that offers high quality video calling. This feature records visuals with complete detailing and allows you to enjoy vivid colors and more depth. It also records videos with sharpness and captures every movement without any distortion. This technology also provides superior audio quality.

C. Speaker

Great sound and small form factor, advanced audio performance with a compact design. On and off button which all you need. Connectivity using aux wire. Built-in rechargeable battery which provides 4 hours non-stop music playback anywhere.

IV. SOFTWARE REQUIREMENTS

A. Espeak

It is a compact open1source software speech synthesizer for English and11other languages for Linux and Windows platform. It is used to convert text to voice. It supports many languages in a small size. The programming1for espeak software is done using rule files with feedback. It supports SSML. It can be modified by voice variant. These1are text files which can change1characteristics such as1pitch range, add effects1such as echo, whisper and croaky voice, or make systematic adjustments to formant frequencies to change the sound of the voice. The default speaking speed of 180 words per minute is too fast to be intelligible. In our project Espeak is used to convert the text to voice signal.

B. OpenCV

It is a library of programming1functions mainly aimed at real-time1computer vision. It is developed by Intel research center and subsequently supported by1Willow Garage and now maintained by itseez. It is written in C++ and its primary interface is also in C++. Its binding is in Python, Java, Matlab. OpenCV runs on a variety of platform i.e., Windows, Linux, MacOS, OpenBSD in desktop and Android, IOS and Blackberry in mobile. It is used in diverse purpose for facial recognition, gesture recognition, object identification, mobile robotics, segmentation etc. It is a combination of OpenCV C++ API and Python language. In our project we are using OpenCV version 2 OpenCV is used to gesture control to open a camera and capture the image. It is also used in the image to text and voice conversion technique.

C. Tesseract OCR

Python Tesseract is an optical character recognition (OCR) engine for different Operating Systems. Tesseract OCR is the process of electronically obtaining text from images and reusing text in a variety of ways, such as editing documents and searching for free text. OCR is a technology which is capable of converting documents into modified data. Tesseract is effective for Linux, Windows and Mac OS. It can be used by programmers to extract typed, printed text from images using an API. Tesseract can use GUI from available 3rd party page. The installation process of tesseract OCR is a combination of two parts-The engine and training data for a language. For Linux OS, Tesseract can be obtained directly from many Linux distributers. In our project Tesseract is used to convert the captured image text into text format.
Tesseract Features:
1) Page layout analysis.
2) More languages are supported.
3) Improve forecast accuracy.
4) Add UI.

## V. DESIGN AND IMPLEMENTATION

A. Text to Voice

In this process gets on for the dumb masses who cannot speak and then they convert their thoughts by text which could be transferred to voice signal. The converted voice message is sent over the speaker. The key board is interface to raspberry pi, the type data will convert in to voice.

B. Image to Voice

The first process is for the blind people, in this process, the visually impaired people have to buy some products or any wordings in the image, in order to help them. We have interfaced the Logitech camera to capture the image. The picture which is captured is being first converted to text. In this OCR, they apply the adaptive thresholding techniques to change the image to binary images. And so, they were transferred them to character outlines and these characters outlines were converted into speech. And the group of words forms the text and it has been read out by the Espeak.

C. Voice to text

The third process, we supply for the hard of hearing people who cannot learn the words of others. In parliamentary law to help them we have used this assistive device for deaf people. This procedure is to receive the voice and convert into text its uses the online application
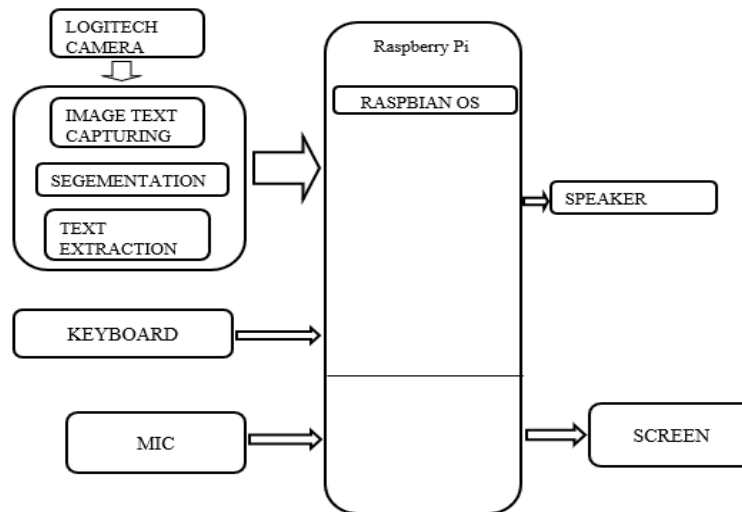
VI. RESULTS

We have designed the prototype model for blind, deaf and dumb people into a single compact device. Using this device, a person can communicate and transfer the message as per his ability and desire. Our proposed system supports real time communication which makes it more efficient. Constructing a system to make blind and visually impaired persons self-dependent. Providing efficient and unique capability in accessing private documents or text.

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